

Introduction

Document overview

This document describes the Digital Trunk Interface (DTI) feature:

- functions
- operations
- associated hardware

Digital Trunk Interface (DTI) is an optional feature and is available on Network enhanced systems equipped with X11 release 5 and later software.

Other documentation

Other Northern Telecom Publications (NTPs) related to DTI are:

- *Digital Trunk Interface/Computer-to-PBX Interface installation and data administration* (553-2811-200)
- *Digital Trunk Interface/Computer-to-PBX Interface maintenance* (553-2811-500)
- *Traffic measurement formats and output* (553-2001-450)
- *Summary of transmission parameters* (553-2201-182)
- *X11 input/output guide* (553-3001-400)

Note: For general reference information on carrier systems and synchronization, see:

- Digital Network Notes, published by Telecom Canada, Ottawa, 1983
- AT&T Technical References 43861 and 41451
- EIA publication PN-1429

Note: Throughout this document, “Meridian 1” refers to Meridian SL-1 machines and Meridian 1 system options, unless otherwise noted.

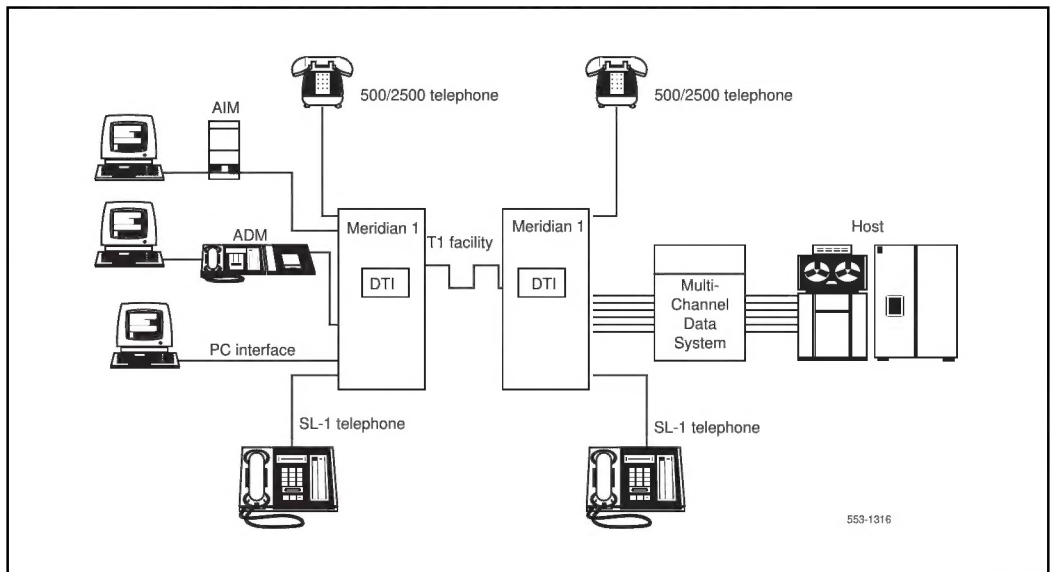
Digital Trunk Interface feature

The Digital Trunk Interface (DTI) provides the means for transmitting digital voice and data between a Network loop and a DS-1 digital carrier. DTI operates similarly to a channel bank for the carrier side and analog trunks for the Meridian 1 side. It integrates Meridian 1 digital switching capabilities and the most commonly available digital transmission facilities. It digitally processes both the transmission and the reception of Meridian 1 data (mixed voice/data) and voice calls.

DTI interfaces to DS-1/D3 digital carriers, which can use infrared, fiber optics, microwave radio, satellite link, or leased T1 facilities and can connect to:

- another Meridian 1 (see [Figure 1](#)) or SL-100
- a non-Meridian 1 system that can use T1 carrier facilities
- a digital Central Office (CO)

Figure 1
Typical Meridian 1 to Meridian 1 communication by means of DTI

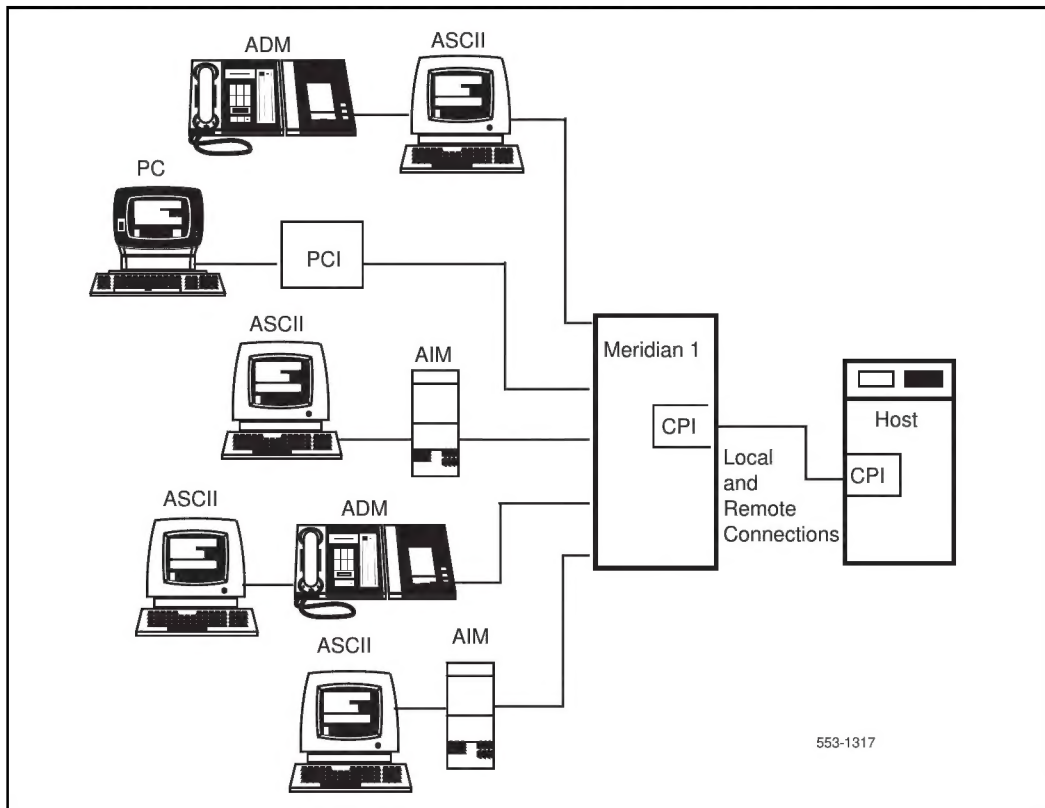


Computer-to-PBX Interface application

The Computer-to-PBX Interface (CPI) is a special application of the DTI feature that uses DTI to connect to a computer vendor-supplied interface residing on the vendor's host computer (see [Figure 2](#)).

The CPI application can be used without Clock Control on systems that support X11 software if the Meridian 1-to-Host connection is direct and not over an external network. External networks are applicable only to Meridian 1 systems and require network Clock Controllers.

Figure 2
Typical Meridian 1 to host computer communication by means of CPI



Benefits

DTI enhances Meridian 1 capabilities by:

- extending its capabilities to create all-digital networks
- utilizing North American standard T1 facilities
- providing full compatibility with T1 digital protocol
- providing a single DTI to support the equivalent of 24 trunks
- eliminating the need for channel banks
- eliminating the need for modems on data transmission
- providing a single network that handles both voice and data
- configuring voice and data capacity on an “as needed” basis
- substantially reducing the amount of equipment required to interface 24 data channels to a host computer equipped with Computer-to-PBX Interface (CPI)

North American T1 carrier DS-1 frame organization

The North American T1 carrier operates at 1.544 Mbps using 193-bit frames in DS-1 format. Each frame contains an 8-bit data sample from each of 24 channels, plus 1 framing bit (F-bit), multiplexed into the 125 μ s time period provided by the 8 kHz sampling rate. This establishes the basic rate of 1.544 Mbps. Signaling is done on a per channel basis by periodically robbing Bit 8 from certain data samples (see [Figure 3](#)).

The framing bit (F-bit) is time-shared to identify both the channel and the signaling frame within a Superframe made up of 12 frames (see [Figure 4](#)). Terminal framing (FT) identifies the location of time slot 1, and signaling framing (FS) identifies those frames in which two signaling bits, A and B, are transmitted on a time-shared basis. The least significant bit (Bit 8) in the 6th and 12th frames are the signaling bits in each of the 24 channels.

Figure 3
DS-1 frame format

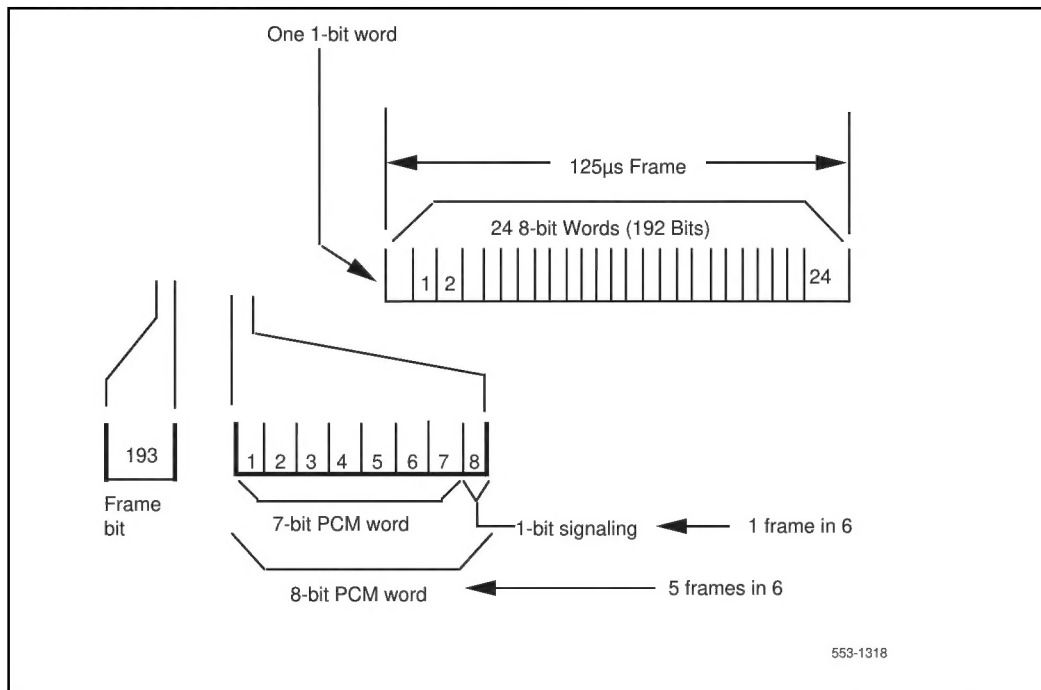
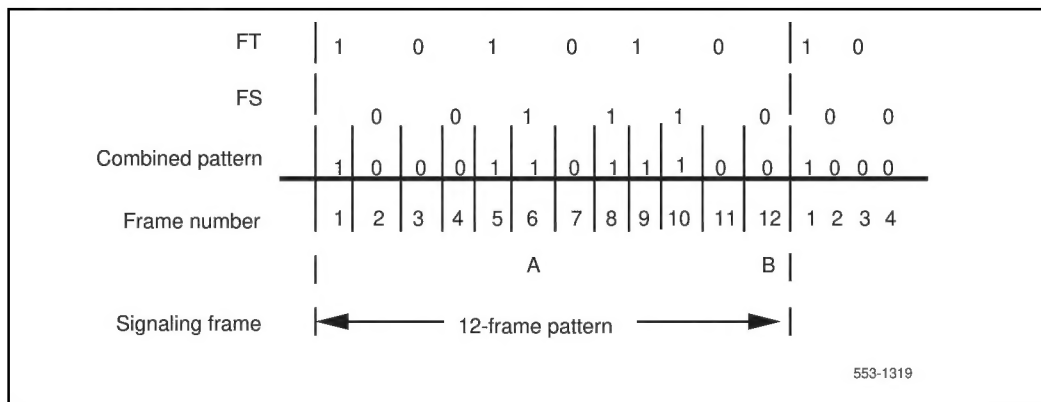


Figure 4
Framing format



B8ZS line coding method

With the increasing demand for higher bandwidths in data transmission, the use of the eighth bit of every channel in every frame of the DS-1 signal has proved to be expensive. The Binary 8 Zero Substitution (B8ZS) line coding method replaces a string of eight zeros with a standard pattern. This pattern has two intentionally added bipolar violations in the signal. At the receiving end, the detected pattern is replaced by the string of eight zeros.

This technique, coupled with the Extended Superframe (ESF) format, increases the data rate from a maximum of 56 kilobits per second to the full 64 kbps if in-band signaling is replaced with out-band signalling. A typical use is with ISDN Signaling Link, described in *ISDN Primary Rate Interface description and administration* (553-2901-100).

Extended Superframe format

The Extended Superframe (ESF) format consists of 24 frames. The 8 kbps framing bit (F-bit) channel is divided into three separate channels:

Channel 1 Framing Pattern Sequence (FPS)—beginning with frame 4 or ESF bit 579, the framing bit of every fourth frame forms FPS 001011, which is used to determine the mainframe, Superframe, and robbed bit signaling synchronization. This sequence is a 2 kbps channel.

Channel 2 Facility Data Link (FDL)—This is a 4 kbps channel. The QPC720 uses FDL to convey remote alarm information or to transmit all ones, as selected in service change.

Channel 3 Cyclic Redundancy Check (CRC)—The CRC sequence is a 2 kbps channel that carries the CRC-6 code. CRC indicates one or more bit errors in a block, or bits from the received bit stream. CRC can be used as an end-to-end bit error rate indicator.

The assignments of the F-bit and the A, B, C, and D bits are shown in [Table 1](#).

Table 1
Extended Superframe format (Part 1 of 2)

Frame number	F-bit				Robbed bit signaling
	Bit number	Assignments			
		FPS	FDL	CRC	
1	0	—	m	—	A
2	193	—	—	CB1	
3	386	—	m	—	
4	579	0	—	—	
5	772	—	m	—	
6	965	—	—	CB2	
7	1158	—	m	—	
8	1351	0	—	—	
9	1544	—	m	—	B
10	1737	—	—	CB3	
11	1930	—	m	—	
12	2123	1	—	—	
13	2316	—	m	—	
14	2509	—	—	CB4	
15	2702	—	m	—	
16	2895	0	—	—	
17	3088	—	m	—	C
18	3281	—	—	CB5	
19	3474	—	m	—	

Table 1
Extended Superframe format (Part 2 of 2)

Frame number	F-bit				Robbed bit signaling
	Bit number	Assignments			
		FPS	FDL	CRC	
20	3667	1	—	—	D
21	3860	—	m	—	
22	4053	—	—	CB6	
23	4246	—	m	—	
24	4439	1	—	—	